vulpinus) from North America, deposited; two Great White Herons (*Ardea alba*), European, purchased; a Moor Monkey (*Semnopithecus maurus*) from Java, a Malabar Squirrel (*Sciurus maximus*) from India, a Red-bellied Squirrel (*Sciurus variegatus*) from Vera Cruz, a Sclater's Curassow (*Crax sclateri* ♀) from South America, a River Jack Viper (*Vipera rhinoceros*) from West Africa, received in exchange; a Wapiti Deer (*Cervus canadensis* ♂), five Brazilian Teal (*Querquedula brasiliensis*), two Chilian Pintails (*Dafila spinicauda*), two Triangular Spotted Pigeons (*Columba guinea*), three Chinese Blue Magpies (*Cyanopolius cyanus*) bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE SPECTRUM OF R CYGNI.—The Rev. T. E. Espin, in Circular No. 21 of the Wolsingham Observatory, reports that he observed a remarkably bright line (apparently F) in the spectrum of this star on August 13. The observation was confirmed on August 22, on which night Dr. Copeland also observed the bright line and determined its position. Dunér's observations of this star in 1879, 1880, and 1882 showed it as possessing a feebly-marked spectrum of the third (Secchi's) type. A change would therefore seem to have taken place in this star. Place for 1887·0, R.A. 19h. 33m. 49s., Decl. 49° 57′·0 N.

MILAN DOUBLE-STAR OBSERVATIONS.—Prof. Schiaparelli has recently published, in No. xxxiii. of the Publications of the Royal Observatory of Brera, the results of his measures of 465 systems of double stars made with the fine 8-inch Merz refractor of that Observatory in the eleven years 1875–85. The observations are nearly 4000 in number, and are for the most part of stars of small distances, *i.e.* less than 5″, apart, the binaries in rapid motion receiving especial attention. The measures are grouped together into four parts, the stars of the Dorpat and Pulkowa catalogues forming the first two, then follow stars discovered by Burnham, and those of other discoverers are grouped together in the last. Besides these detailed results of the measures made with the old 8-inch, with which Prof. Schiaparelli has done so much excellent work in the past, there are given in an appendix mean results for a number of the closest pairs as measured with the new 18-inch refractor. Prof. Schiaparelli seems well satisfied with the performance of this new instrument, and records the discovery that the principal star of Σ 1273, ε Hydræ, is itself a very close double, a fact that had hitherto escaped notice, notwithstanding the number of observations which have been made with various telescopes upon the star. The magnitudes of the two components of the new double are 4 and 5·5, and the distance is 0″·2 or 0″·25. The earlier part of the volume contains a detailed description of the optical performance of the 8-inch refractor, a discussion of the errors of the micrometer and of the accidental errors of observation, a determination of the systematic errors of observation, and a very full comparison with Dembowski's measures. The differences in the determination of position-angle due to the varying inclination of the line joining the two stars to the line of the observer's eyes are also investigated, but the reversion prism was not used. Prof. Schiaparelli finds that on the whole his measures of distance are free from systematic errors due to personality, but his position-angles have a tendency to be small as compared with those of other observers.

Amongst the notes to some of the more interesting stars is one on OΣ 285 in which a correction of 180° is suggested to the angles of Englemann and Perrotin in 1883 and 1885, the star being supposed to have passed rapidly through periastron in the long period from 1865 to 1883, in which it was unobserved. All the observations would then be satisfied by an ellipse of 100 years of revolution. Σ 2367 and Σ 2525 are noted as appearing as single stars with the 18-inch refractor in 1887.

ENCKE'S COMET.—Mr. John Tebbutt, Windsor, New South Wales, informs us that he picked up this object on the evening of July 8. Its place as observed closely accorded with that given in Dr. Backlund's ephemeris.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 *SEPTEMBER* 2–8.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on September 2

Sun rises, 5h. 17m.; souths, 11h. 59m. 21·6s.; sets, 18h. 42m: right asc. on meridian, 10h. 47·6m.; decl. 7° 40′ N. Sidereal Time at Sunset, 17h. 31m.

Moon (New on September 6, 5h.) rises, 0h. 39m.; souths, 8h. 49m.; sets, 16h. 55m.: right asc. on meridian, 7h. 37·2m.; decl. 20° 54′ N.

Planet.	Rises.		Souths.		Sets.		Right asc. and declination on meridian.			
	h.	m.	h.	m.	h.	m.	h.	m.	°	′
Mercury..	6	2	12	33	19	4	11	21·6	5	28 N.
Venus.....	6	35	12	55	19	15	11	43·3	3	12 N.
Mars......	12	26	16	39	20	52	15	27·8	20	24 S.
Jupiter....	12	38	16	58	21	18	15	47·5	19	19 S.
Saturn....	2	43	10	19	17	55	9	6·9	17	19 N.
Uranus...	8	33	14	9	19	45	12	57·5	5	29 S.
Neptune..	21	28*	5	15	13	2	4	2·4	18	59 N.

* Indicates that the rising is that of the preceding evening.

Occultations of Stars by the Moon (visible at Greenwich).

Sept.	Star.	Mag.	Disap.		Reap.		Corresponding angles from vertex to right for inverted image.	
			h.	m.	h.	m.	°	°
2	61 Geminorum	6	0	4	0	50	84	216
3	B.A.C. 2854	6	4	54	near approach		135	—

Sept.	h.	
4	1	Saturn in conjunction with and 0° 34′ south of the Moon.
7	0	Mercury in conjunction with and 3° 46′ south of the Moon.
7	7	Venus in conjunction with and 3° 32′ south of the Moon.

Variable Stars.

Star.	R.A.		Decl.							
	h.	m.	°	′				h.	m.	
λ Tauri	3	54·5	12	10	N.	Sept.	4,	20	26	*m*
ζ Geminorum	6	57·5	20	44	N.	,,	8,	21	0	*m*
δ Libræ	14	55·0	8	4	S.	,,	6,	21	42	*m*
V Ophiuchi	16	20·5	12	10	S.	,,	6,			*M*
U Ophiuchi	17	10·9	1	20	N.	,,	4,	1	15	*m*
						,,		21	22	*m*
W Sagittarii	17	57·9	29	35	N.	,,	8,	1	0	*m*
β Lyræ	18	46·0	33	14	N.	,,	7,	23	0	m_2
R Lyræ	18	51·9	43	48	N.	,,	2,			*M*
S Vulpeculæ	19	43·8	27	1	N.	,,	2,			*M*
η Aquilæ	19	46·8	0	43	N.	,,	7,	0	0	*M*
R Sagittæ	20	9·0	16	23	N.	,,	6,			*m*
X Cygni	20	39·0	35	11	N.	,,	5,	3	0	*M*
T Vulpeculæ	20	46·7	27	50	N.	,,	2,	3	0	*M*
δ Cephei	22	25·0	57	51	N.	,,	4,	1	0	*m*

M signifies maximum; *m* minimum; m_2 secondary minimum.

Meteor-Showers.

	R.A.	Decl.	
	°	°	
Near Algol	43	39 N.	Swift; streaks.
,, ε Lyræ	282	42 N.	Swift; bright.
,, β Piscium	345	1 N.	Slow; bright.

GEOGRAPHICAL NOTES.

THE current number of the Proceedings of the Royal Geographical Society contains the report of his first year's work by Mr. Mackinder, the Reader in Geography to the University of Oxford, whose appointment is due to the Society. He describes the year as one of reconnoitre and preparation; nevertheless he delivered forty-two ordinary lectures in the University, and one public lecture; in each of the three terms he lectured for seven weeks twice a week, having two courses going on side by side on different days, to one of which he imparted a scientific, to the other an historical bias. The notices were, by permission of the Board of Faculties, published in the lists of two separate Faculties—Natural Science and Modern History. On the scientific side the lectures have been on the principles of geography—"a review of the subject not merely physical, yet taking the feature, and not the region, as the basis of classification." This course has not been so well attended as the other, but Mr. Mackinder congratulates himself that he has never been wholly without an audience, "a fate not altogether unknown just now to Oxford Professors and Readers." On the historical side the lectures were on the geography of Central Europe, and the influence of physical features on man's movements and settlements. "My aim is

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to furnish general instruction to as large a number as will favour me with their attention; and also to have always round me two or three whom we may style specialists. I can only say that I now see a very fair prospect of obtaining the latter. It may be well to place on record my humble opinion, that the best preliminary training for a geographical *specialist* is sound grounding in general science, and superadded to this an elementary knowledge of history. I have found by experience that it is exceedingly hard to give the necessary scientific knowledge to an historian"—a somewhat hard saying for the historians. In the coming academical year the lectures will be on the physical geography of continents, the geography of the British Isles, and the historical geography of North America. As Extension Lecturer, Mr. Mackinder has delivered 102 lectures on geography and physiography at various towns throughout the country.

IN the August number of the *Scottish Geographical Magazine*, Mr. Forbes reports on his attempts to reach the Owen Stanley Peak, and incidentally describes the moving adventures by flood and field of his last expedition. Although not successful, owing to more than one unexpected mishap, in reaching his goal, he claims that the results accomplished so far have not been few or inconsiderable. Large additions have been made to botanical and some to zoological science; an extensive series of meteorological observations has been tabulated, and a tract of country has been mapped for the first time. Mr. Ravenstein briefly describes the recent explorations in the territories of the African Lakes Company between Nyassa and Tanganyika. Both these papers are accompanied by excellent maps. Archdeacon Maples, of the Universities Mission to Central Africa, gives a detailed account of Lukoma, the principal island in Lake Nyassa, which, although only 4½ miles long by 2½ broad, has a population of 2500, or about 220 to the square mile, in consequence of its comparative freedom from war. "Ula," or witchcraft, of the kind described by Mr. Rider Haggard with such graphic force in one of his earlier works, prevails, and is a curse to the island. Herr Metzger contributes a most interesting paper on the scientific work lately done in the Dutch East Indies, based mainly on recent Government publications and those of various learned Societies in Holland and Java.

THE current number of the *Deutsche Geographische Blätter* contains two papers of considerable geographical and ethnological interest. The first, by Herr August Fitzau, is devoted to the little-known region of the north-west African seaboard between Morocco and the Senegal River. After an historical survey of the various attempts made to found European settlements in this region, the writer describes in detail the sections of the coast between Agadir and Cape Juby, and thence to Saint Louis. He then deals with the Western Sahara in general, and especially with the ethnological relations of the regions south of the Atlas and north of the Senegal River, arriving at the general conclusion that, although Arabic has become the dominant language, the old Berber or Hamitic is still the prevailing ethnical element, variously modified by Semitic and Negro influences. In the second paper the distinguished traveller and ethnologist, Dr. O. Finsch, gives a sympathetic and permanently valuable account of the life and work of the late Mikluho-Maclay, to whom anthropological science is so much indebted for his profound studies of the Malayan, Papuan, Negrito, Melanesian, and Australian races. The memoir is very complete, including a detailed account of the naturalist's travels with their scientific results, his vast ethnological collections and the zoological stations founded by him, and concluding with a full descriptive-catalogue of his numerous geographical, anthropological, and zoological writings.

THE July number of the *Bollettino* of the Italian Geographical Society is mainly occupied with Leonardo Fea's recent explorations in Tenasserim. The chief points visited were the curious "Farm Caves" in the Moulmein district, and Mount Mulai (Moolaee) in the Dona Range. This peak, culminating point of Tenasserim (6300 feet), was reached and ascended to its summit after a journey full of difficulties and hardships, which followed the course of the Jeeayng-Myit and its great southern tributary, the Unduró, as far as Meetan in 46° N., 98° 30′ E. From Meetan the route struck north to Tagata and Mulai through the hilly territory of the little-known Ayaeen Karens. Of this tribe Signor Fea gives an interesting account, and he was also successful in securing a large zoological collection, including 450 skins of birds, over 400 mammals, many hundred reptiles, batrachians, and fishes, besides numerous insects, spiders, mollusks, and other small animals. These treasures go to enrich the valuable zoological materials already brought together in the Natural History Museum founded at Genoa by the Marquis Giacomo Doria. The paper is accompanied by a map of the region explored, as well as by several original sketches by the naturalist himself. The Marquis Doria has added a useful list of the various memoirs that have appeared in connection with Signor Fea's geographical and biological researches in Burmah during the last four years.

THE most important amongst recent explorations in Indo-China are those undertaken by the Vice-Consul for France at Luang Prabang, the capital of an outlying region of Siam of the same name, and itself situated on the Mekong. M. Pavie, the official in question, has since succeeded in reaching Tonquin from this place by two different routes, the most practicable apparently being that to the north-east along the valley of the Namseng, a tributary of the Mekong, and then across the mountains forming the watershed of the Mekong and Songkoi, or Red River of Tonquin, to the valley of Nam Tay or Black River, down which M. Pavie proceeded to Sontay and Hanoi.

AT a recent meeting of the Swedish Geographical and Anthropological Society, Baron H. von Schwerin gave an account of his late expedition to the Congo and West Africa, extending over a period of nearly two years, and undertaken at the instance of the Swedish Government. He had proceeded in a steamer as far up the Congo as Stanley Falls, and then up the Kassai, the principal tributary of the former. Next he had, in the company of his countryman, Lieut. C. Håkansson, explored the basin of the Inkissi, another tributary of the Congo, and from Banana made an excursion into the land of the Mushirongi, south of the mouth of the river, a country never hitherto visited by any European. After a journey to Angola and Mossamedes, on the west coast, a journey performed in a sailing-vessel, and extending as far north as Cape Negro, he made an excursion into the lands of Kakongo and Kabinda, situated to the north of the mouth of the Congo, which had also hitherto been considered closed to Europeans. The heat on the Congo was not so excessive as was generally imagined. A temperature above 35° C. was rare, but what were particularly enervating and exhausting were the steadiness of the high temperature and the total absence of cooling breezes, whether in the shade or at night, and, more than either, the excessive humidity of the air. He considered the climate of the Congo one of the healthiest in Africa. Finally, Dr. Schwerin gave an account of his discovery on the promontory south of the Congo River of the remains of the marble pillar raised there in 1484 by Diego Cam in commemoration of the discovery of this mighty river, and destroyed by the Dutch in the sixteenth century. The speaker also exhibited a large and valuable collection of scientific objects gathered in Africa.

NOTES ON METEORITES.

I.

THEIR FALL AND PHYSICAL CHARACTERISTICS.

A PERUSAL of the Chinese annals—which reach back to the year 644 before our era, and are still models of patient record—or of the much more irregular and less complete ones of the Western world, shows in the most definite manner that since the very commencement of human history, from time to time falls of bodies on to the earth from external space have been noticed. Biot has traced in Ma-tuan-lin the record of sixteen falls from the date before mentioned to A.D. 333.

The earliest fall recorded in Europe, however, transcends in antiquity anything the Chinese can claim, dating as it does from 1478 B.C. It happened in Crete, but the record is much more doubtful than that of the falls in 705 and 654 B.C., noted, the first by Plutarch, and the second by Livy.

But in 466 B.C. occurred a fall at Aegos Potamos, in Thrace, concerning which the Chronicles of the Parian marbles, Plutarch, and Pliny all give us information. It was of the size of two mill-stones, and equal in weight to a full waggon-load.[1] Later, there fell in Phrygia, in about the year 204 B.C., a stone famous through long ages, which was preserved there for many generations. It was described as "a black stone, in the figure of a cone, circular below and ending in an apex above." It was worshipped by the ancients as Cybele, the mother of the gods,

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[1] Humboldt, "Cosmos," Otté's translation, vol. i. p. 103.

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